Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/84
FRANCE
February 1964
Original: FRENCH

Confidential until official release during Conference

Abstract

CRITICALITY STUDIES

by MM. D. BRETON - Département des Etudes de Piles - C.E.A. Saclay
R. CAIZERGUES - Département des Usines de Séparations Isotopiques C.E.A. SACLAY
C. CLOUET d'ORVAL - Département des Etudes de Piles - C.E.A. SACLAY
G. SOLLIER - Service de Construction des Usines de Traitement des Combustibles Irradiés - C.E.A. Montrouge
P. LECORCHE - Département des Usines de séparations Isotopiques C.E.A. SACLAY
J. MOREAU - Département des Etudes de Piles - C.E.A. SACLAY

(Commissariat à l'Energie Atomique, France)

Criticality studies made at the Commissariat à l'Energie atomique deal on the one hand with experiments on plutonium and uranium solutions, on the other hand with theoretical work on the development and use of computation methods for the resolution of problems concerning the nuclear safety of chemical and metallurgical plants.

I - Since 1958 the experimental studies have dealt with homogeneous media constituted by a fissile salt dissolved in light water. Developed using the reactor Proserpine, the experiments have been carried on at Saclay on the Alec-

Translation provided by courtesy of the submitting Government

to assemblies where solutions of plutonium or of 90 p. 100 - enriched uranium can be made critical.

The results already obtained relate to critical masses of cylindrical tanks of diameters from 20 to 50 cm, reflected in several ways (water, concrete, etc...) at concentrations up to 100 g/liter. Physical measurements (spectra, reactor noises) and interaction measurements complete the results.

Other experiments relating to plutonium solutions were begun in 1963 at the Valduc Center. They deal with the study of critical masses of annular vessels of external diameter 50 cm and internal diameter varying from 10 to 30 cm. These vessels can be water reflected internally, externally, or both. Two of these vessels have been studied in interaction for various geometries.

Slabs of various thicknesses were also studied.

II - The studies thus undertaken allowed the development of methods of computation which have been tested on several experiments. Particular use has been made of the possibilities of calculations based on transport theory and on Monte Carlo methods.

All these theoretical studies are applied to the design and control of industrial plants from the point of view of safety.